MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

BOM 2064 – QUALITY AND OPERATIONS MANAGEMENT

(All Sections / Groups)

12 AUGUST 2022
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FIVE (5) PAGES** with **FOUR (4)** questions only.

2. Answer **ALL** questions. The distribution of the marks for each question is given at the end of each question.

3. Please write all your answers in the answer booklet provided.

QUESTION 1

a) Weekly sales of copy paper at Mimosa Suppliers are provided in the table below. Compute a THREE-period moving average and a FOUR-period moving average for weeks 5, 6, and 7. Compute the MAD for both forecasting methods. Which model is more accurate? Forecast week 8 with the more accurate method.

Week	Sales (cases)
1	17
2	21
3	27
4	31
5	19
6	17
7	21

(13 marks)

b) The department manager using a combination of methods has forecast sales of toasters at a local department store. Calculate the MAD for the manager's forecast. Compare the manager's forecast against a NAIVE forecast covering the same time period. Which is better?

Month	Unit Sales	Manager's Forecast
January	52	-
February	61	-
March	73	-
April	79	-
May	66	-
June	51	-
July	47	50
August	44	55
September	30	52
October	55	42
November	74	60
December	125	75

(12 marks)

(Total: 25 marks)

Continued...

QUESTION 2

a) Based on the following data, compute the lower and upper control limits and determine whether the process is in control.

(Note: Write your answers in nearest **TWO** decimals)

Sample Number	Item 1	Item 2	Item 3	Item 4
1	12.2	12.6	12.0	12.1
2	11.9	12.5	12.4	12.7
3	12.0	12.2	12.9	13.1
4	12.5	12.5	12.4	12.8
5	12.2	12.8	12.7	12.0
6	12.1	12.5	11.8	12.3
7	12.3	12.4	12.8	12.4
8	12.0	12.1	12.4	12.2
9	12.1	12.8	12.4	11.9
10	12.6	12.4	12.1	12.3

(15 marks)

b) The specifications for a manifold gasket that installs between two engine parts calls for a thickness of 2.500 mm ± 0.020 mm. The standard deviation of the process is estimated to be 0.004 mm. The process is currently operating at a mean thickness of 2.50 mm.

i. What are the upper and lower specification limits for this product? (4 marks)

ii. What is the *Cp* for this process? (2 marks)

iii. The purchaser of these parts requires a capability index of 1.50. Is this process capable? Is this process good enough for the supplier? (2 marks)

iv. If the process mean were to drift from its setting of 2.500 mm to a new mean of 2.497, would the process still be good enough for the supplier's needs? (2 marks)

(Total: 25 marks)

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QUESTION 3

a) Describe the concept of supplier evaluation. (5 marks)

b) Differentiate between single sourcing and dual sourcing. (8 marks)

c) Elaborate **SIX (6)** potential drawbacks of single sourcing. (12 marks)

(Total: 25 marks)

QUESTION 4

a) Highlight the **FOUR (4)** types of inventory. (8 marks)

b) What are the **FOUR (4)** functions of inventory? (8 marks)

c) Amigo Coffee Shop uses 4 pounds of a specialty tea weekly; each pound costs RM 16. Carrying costs are RM 1 per pound per week because space is very scarce. It costs the firm RM 8 to prepare an order. Assume the basic EOQ model with no shortages applies. Assume 52 weeks per year, closed on Mondays.

i. How many pounds should Amigo Coffee Shop order at a time? (2 marks)

ii. What is total annual cost (excluding item cost) of managing this item on a cost-minimizing basis? (3 marks)

iii. In pursuing lowest annual total cost, how many orders should Amigo Coffee Shop place annually? (2 marks)

iv. How many days will there be between orders (assume 312 operating days) if Amigo Coffee Shop practices EOQ behavior? (2 marks)

(Total: 25 marks)

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Relevant Equations

1) CL = $\overline{\overline{X}}$, $\overline{R}$

UCL, LCL (X – bar) = $\overline{\overline{X}} \pm A_2 \overline{R}$

UCL (R) = $D_4 \overline{R}$

LCL (R) = $D_3 \overline{R}$

Table for X – bar & R Charts

No of Observation	A2	D3	D4
In sub group n			
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2.00

2) UCL c = $\overline{c} + 3\sqrt{\overline{c}}$

LCL c = $\overline{c} - 3\sqrt{\overline{c}}$

3) $\overline{p}$ = Total No of Defective from All Samples/ (No of Samples X Sample Size)

$Sp = \sqrt{[\overline{p}(1 - \overline{p})/n]}$

CL = $\overline{p}$

LCL = $\overline{p} - 3\,Sp$

UCL = $\overline{p} + 3\,Sp$

4) Capacity Utilization = Capacity Used / Best Operating Level

5) $$r = \frac{n\sum XY - [\sum X \sum Y]}{\sqrt{\left[n\sum X^2 - (\sum X)^2\right]\left[n\sum Y^2 - (\sum Y)^2\right]}}$$

$$a = \overline{Y} - b\overline{X}$$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

6) Exponential smoothing

Forecast for the month t: $F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$

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7) Inventory Management:

$$\text{EOQ} = Q^* = \sqrt{\frac{2DS}{H}} \qquad TC = \frac{Q}{2}H + \frac{D}{Q}S$$

$$\text{EPQ} = Q_0 = \sqrt{\frac{2DS}{H}}\sqrt{\frac{p}{p-u}} \qquad I_{\max} = \frac{Q}{P}(p-u) \qquad TC = \frac{I_{max}}{2}\text{H} + \frac{\text{D}}{\text{Q}}\text{S}$$

$$SS = z\,(\sigma d)\sqrt{LT} \qquad ROP = \bar{d}\,(LT) + z(\sigma d)\sqrt{LT}$$

8) Lean Operations:

$$N = \frac{DT(1+X)}{C}$$

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